

aeromet

SEASONAL PROGRESS REPORT NO. 7

for the period

September, October, and November 1977

to

REGION VIII

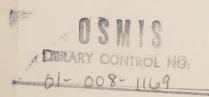
1860 Lincoln St., Suite 900

Denver, CO 80203

Contract No. 68-01-1946

U-a- U-b

TN 859 .U82 W448



aeromet inc.

P.O. BOX 45447 TULSA, OKLAHOMA 74145

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to

ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
1860 Lincoln St., Suite 900
Denver, CO 80203

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by

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SEASONAL FUNCASS REPORT ID. T for the period September, October, and November 1977

ENVIRONMENTAL PROTECTION AGENCY REGION VIST 1860 Lincoln St., Sulta 900 Denver, Co 80203

Contract No. 58-01-1946

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1.0 INTRODUCTION

Low level temperature and wind data were collected for the fall seasonal report at the U-a/U-b Tract 5 miles south of Bonanza, Utah for the period September 1-26 and at Bonanza, Utah for the period September 28 through November 31, 1977.

The data were collected using a 30 gm helium filled pilot balloon with a temperature sonde attached, a single theodolite and a TSR-2 receiver/recorder twice a day every other day. The observations were scheduled ½ hour after sunrise and at 1400L.

The pilot balloon had an ascent rate of 500 ft/min and was tracked by a single theodolite for 12 minutes with the azimuth and elevation angles recorded every 30 seconds on a cassette tape recorder. The tape was transcribed to a pilot balloon form after the observation.

The temperature sonde operated at 403 MHz and the signal was received by a ground plane antenna at least 16 ft AGL which was attached to the Aeromet, Inc. TSR-2 receiver/recorder. The TSR-2 receiver has a built-in Rustrak strip chart recorder and the temperature was recorded within the range from -50°C to +50°C. A baseline temperature calibration was performed with each T-Sonde by the adjustment of the recorded temperature to match the thermometer measured temperature next to the transmitting sonde. Once the calibration check was finished the balloon was released with the sonde attached and the temperature was recorded for at least 20 minutes. At the completion of each observation the data were mailed to Aeromet, Inc.

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Low lavel compensation and wine data moral collected for the (all seasons) report at the U-s/U-b freet 5 elles south of Horantz, Utan for the partod September 1-25 and at Bonanza, Utan for the partod September 28 through November 31, 1977.

The data were collected using a 30 gm relium *111ed pilot helicon with a temperature souds attacked, a vingle sheedelite and a 158-2 receiver/recorder twice a day every other day. The observations were scheduled a hour strer summise and at 1400L.

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2.1 Mixing Layer Height

The average mixing layer height was computed for the morning and afternoon based on the morning and 1400L temperature soundings. The balloon release \frac{1}{2} hour after sunrise is near enough to the minimum temperature to assume the correctness of the calculated mixing layer heights. The afternoon balloon release is generally not at the time of maximum heating and the user of the mixing layer height data must be aware that minor changes in the calculated values can be expected. Without equipping the field sites with minimum/maximum thermometers the extrapolation of the afternoon data cannot be justified in establishing a data base for statistical analysis. The approximation of the afternoon maximum temperature would be a "calculated guess" for there are: 1) local effects which are to be determined and would be filtered out with extrapolation, 2) mountain effects which alter the lower 1500m (e.g. downslope effects), and 3) meteorological effects which can alter the expected change in the sounding (e.g. advection, moisture, etc.).

It is felt that to better define the mixing layer height a variety of "heat island" effects should be viewed. The rigorous method would be to define 15 "heat island" effects ranging from 0 to 14°C and let the user decide which would best serve his needs. However, for this analysis 0°, +5° and +10° "heat island" effects were considered.

A summary of the average mixing layer heights calculated with the 0°, +5° and +10° "heat island" effects at the U-a/U-b Tract for the fall season of September, October and November 1977 are included in the report. The percent of occurrence of the average height within 250m increments above ground level is given in tabular form. The total number of soundings included in the sample populations are listed in the table.

2.2 Stability and Inversion Classification

The temperature and wind data were edited to remove data felt to cause anomalous results in the stability and inversion classification schemes. Only the stations listed prior to the table classifying the inversions were used in the calculations.

The temperature data are processed to produce a seasonal summary of inversion layers and lapse rates within the inversions and from the inversion base to the surface by means of the Holzworth classification scheme for inversions (Holzworth, G. C., 1974: "Climatological Data on Atmospheric Stability in the United States" paper presented at the American Meteorological Society Symposium on Atmospheric Diffusion and Air Pollution, September 9-13, 1974, Santa Barbara, California.)

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2.2 Stability and Inversion Charactivasion

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The temperature and wind data are processed together to produce an average bivariate frequency distribution of wind direction versus wind speed represented in the 500m layer adjacent to the ground for the summer season. The distribution is presented by the six Pasquill stability classes (A-F) and a summary independent of stability. If the $\Delta T/100m$ criterion is met but the wind speed criterion is not met, then the wind data are checked against the criterion for the next stability class,

STABILITY CLASS	ΔT ('C/100m)	WIND SPEED (m s-1)
A B C D E F	<-1.9 -1.91.7 -1.71.5 -1.50.5 -0.5 - 1.5 >1.5	<2 <5 <6 ALL SPEEDS <5 <3

always cascading to the D stability class. Once the wind speed criterion is met the data are classified under the new stability class even though now the lapse rate exceeds the class criterion. For example, if the $\Delta T/100m$ value is 1.7 and the wind speed is 7 m s $^{-1}$, the lapse rate criterion is met for the stability class F, however the wind speed criterion is exceeded. The wind speed is greater than the 5 m s $^{-1}$ maximum limit for class E but falls within the criterion of class D, which includes all wind speeds. As a result the observational data with a ΔT value of 1.7°C/100m and a wind speed value of 7 m s $^{-1}$ are classified under stability class D, not class F.

The data are also punched on computer cards in a format compatible with the STAR PROGRAM of the National Climatic Center, NOAA, U.S. Department of Commerce. A description of the punched output can be found in the Monthly Progress Reports.

The temperature transposes are processed together to produce to average wind average alvertate frequency startlantion of wind direction versus wind speed represented in the SOOM Tayer adjacent to the ground for the speed of the classes (A-F) and a summery independent of attribute. If the all the startlands of attributed is not the classes the column to the column

always eastading to the D stability class. Once the wind speed criterion is met the date are classified under the new stability class even though now the lapse rate executes the class criterion. For example, if the AT/100m value is 1.7 and the wind speed to 7 m s-1, the lapse rate criterion is not too the tablity class F, however the wind speed criterion is class the lapse rate criterion of class E but falls wind speed is prester than the B m s-1 maximum limit for speeds. As a vesuit the observations of class D, which includes all wind and a wind speed value of T m s-1 are classified under stability alass D, not class F.

The data are also punched on computer cards in a format compatible with the STAR PROCEED of the Mattorn! Clientic Coster, WOAA, U.S. Department of Commerce. A description of the punched output can be found in the Manchie Progress Reports.

AVERAGE MIXING LAYER HEIGHT Utah U-a/U-b Tract SEASONAL: September, October, and November 1977

MIXING LAYER HEIGHT (Height in meters)	M	PER ORNING	CENT OF OC		FTERNOON	
(Height in meters)	0.	+5.	+10:	0.	+5*	+10.
surface	80.6			9.1		
1 - 250m	19.4	62.8	5.7	39.4		
251 - 500m		11.4	8.6	15.2	3.0	
501 - 750m		2.9	31.4		3.0	3.0
751 - 1000m		5.7	8.6	3.0	9.1	
1001 - 1250m		8.6	5.7	9.1		
1251 - 1500m		2.9	5.7	12.1	12.1	3.0
1501 - 1750m			5.7	6.1	6.1	3.0
1751 - 2000m			5.7		9.1	3.0
>2000m		5.7	5.7	3.0	45.4	45.5
None defined			17.2	3.0	12.1	42.4
TOTAL NUMBER	36	35	35	33	33	33



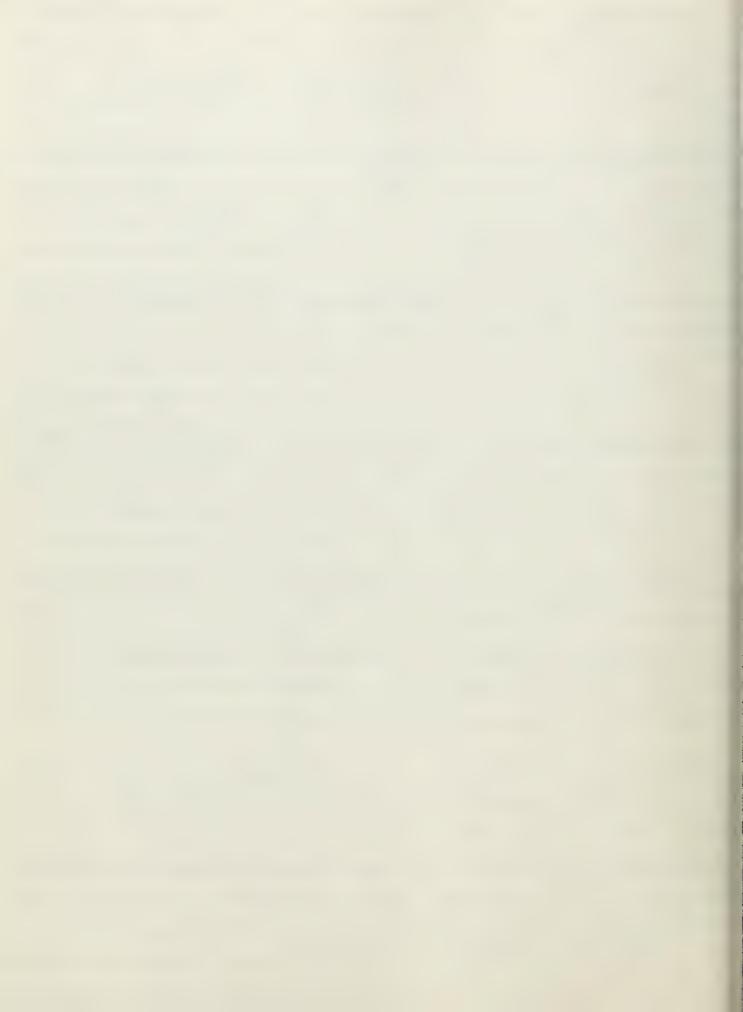
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	ASCENT HATE SOU FRM DATA INTERVAL 15 SEC.
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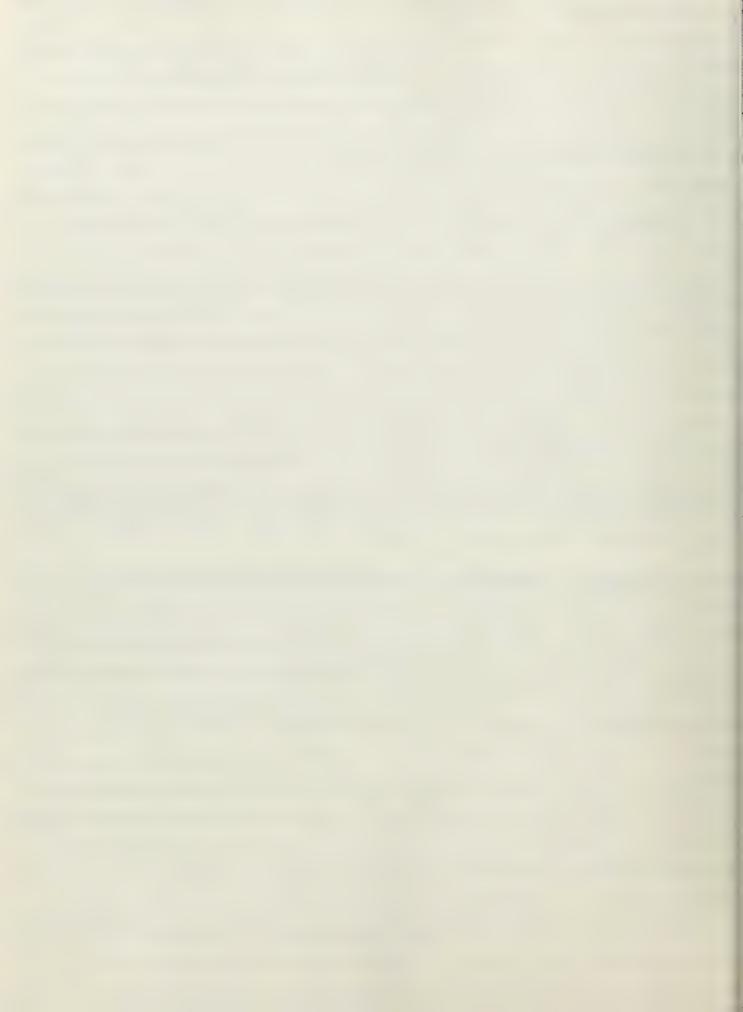
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			SOUNDING ID 5674
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		500 750 1000 1500 	*******
DATE 09/12/77			PM DATA INTERVAL 15 SEC.
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			M DATA INTERVAL 15 SEC.
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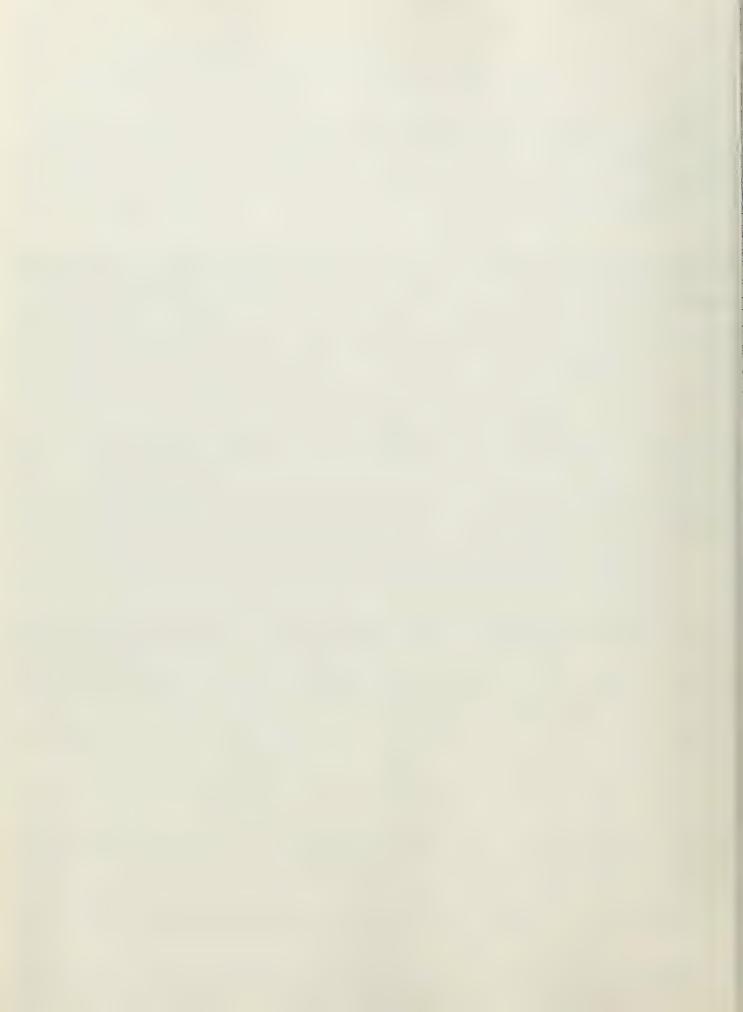
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			SUUNDING ID 5657
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TAR	AUU .	ELEV 1565 PETERS	30UNDING 10 5057	
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01 AH U		ELEV 1585 PETERS	FPM DATA INTERVAL 15 SEC
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DATE OF COLUMN		FLEV 1076 PETERS	SOUNDING ID 5677



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DATE 10/05/77 TIME 05:44 ST ASCENT HATE SOU FPM DATA INTERVAL 15 SEC.
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  METERS AGI
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                   ELEV 1676 METERS SOUNDING ID 5681
DATE 10/06/77 TIME 14:03MST ASCENT RATE 500 FPM
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METERS AGE (DEG C)/100M
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		A DESCRIPTION	
******	******	******	********
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DATE 10/15/77		en en arte constante en men eta consideralistici	FPM DATA INTERVAL 15 SEC.
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UTAH U		ELEV 1076 METERS	SOUNDING ID OF
		1NV DI/DZ (DEG C)/100M	DT/DZ HELDM INV (DEG C)/100M
UTAH U	AUB		SOUNDING ID 5699 FPM DATA INTERVAL 15 SEC
INV BASE METERS AGE	METERS AGL	10V DT/DZ (DEG C)/100B	OT/DZ BELOW INV (DEG C)/100M
- ARRARMARAMARA Ulan II		- ASCENT RATE 500	FPM DATA INTERVAL 15 SEC
METERS AGE	METERS AGE. 207.	(nes c)/100M	D1/DZ BELOW INV (DEG C)/100M
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			EPM DATA INTERVAL 15 SEC
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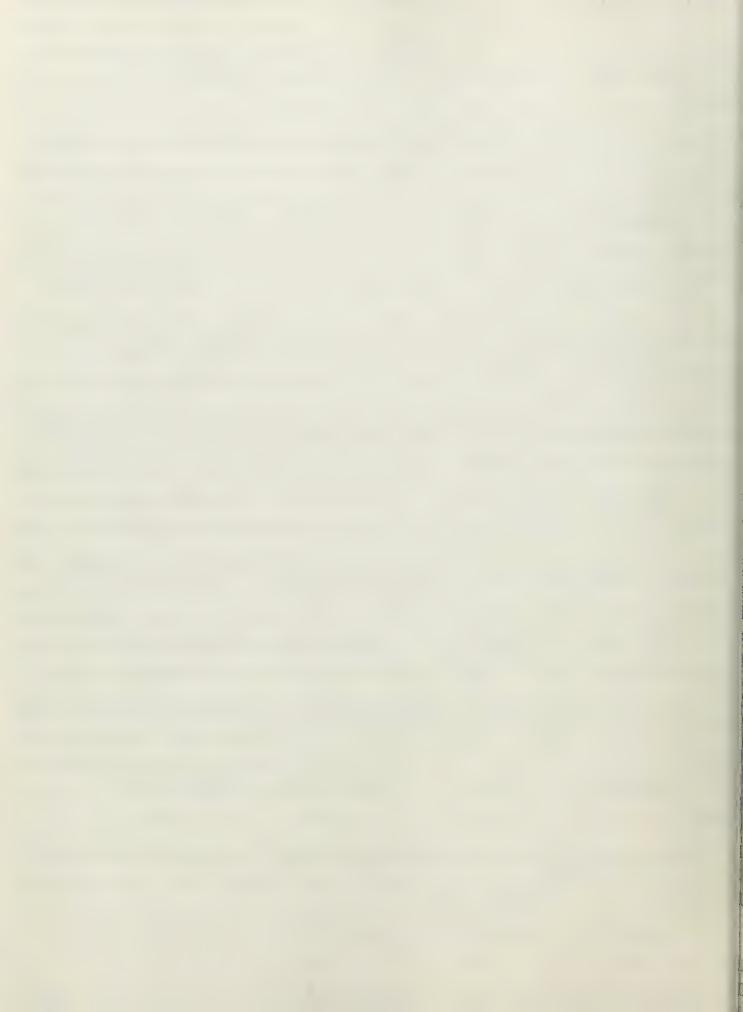
			FPM DATA INTERVAL 15 SEC
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DATE 11/05/77		ASCENT RATE 500	FPM DATA INTERVAL 15 SEC.
METERS AGL		(DEG_C)/1VOM	DEG C)/100M
*********	*******	FLEV 1370 METERS	**************************************



DATE 11/05/77			M DATA INTERVAL 15 SEC
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			M DATA INTERVAL 15 SEC
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UTAH UA	UB E	LEV 1770 METERS	**************************************
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		.1.v 01/02 0 .tneg c)/100M	

			A DATA INTERVAL 15 SEC.
			I/DZ BELUM INV (DEG E)/100M

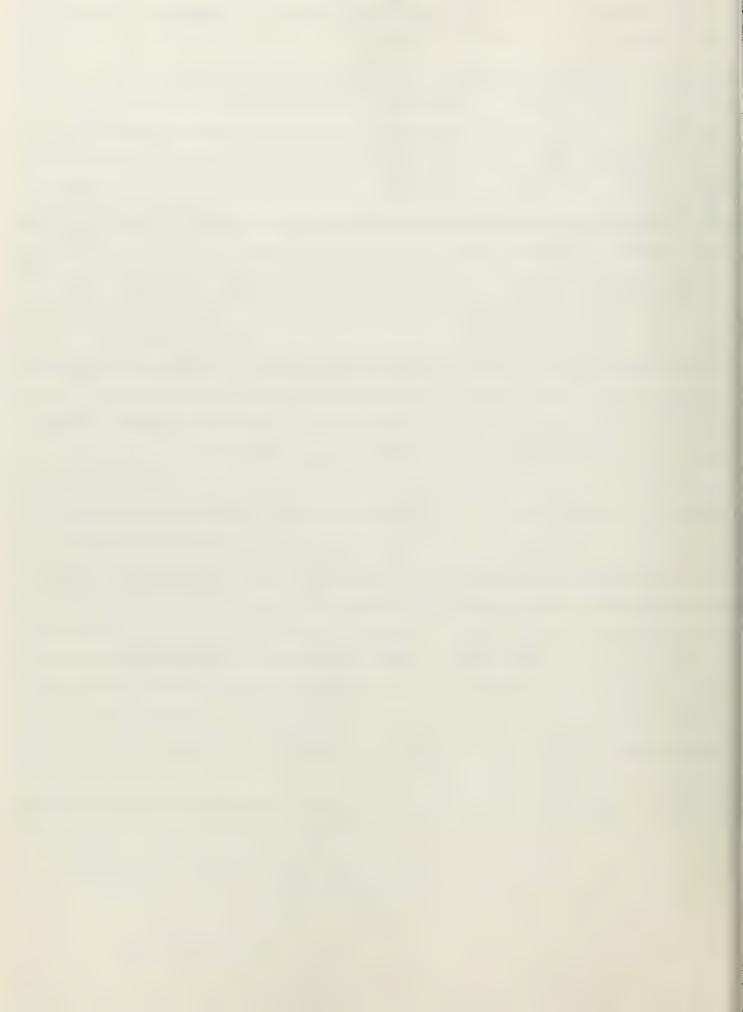
DATE 11/11/77	TIME 13:550%T	ASCENT HALE 500 FP	M DATA INTERVAL 15 SEC.
		(DEG C)/106M	
*******		0.61	
UTAH UA	08	LEV 1076 METERS	SOUNDING ID 5739



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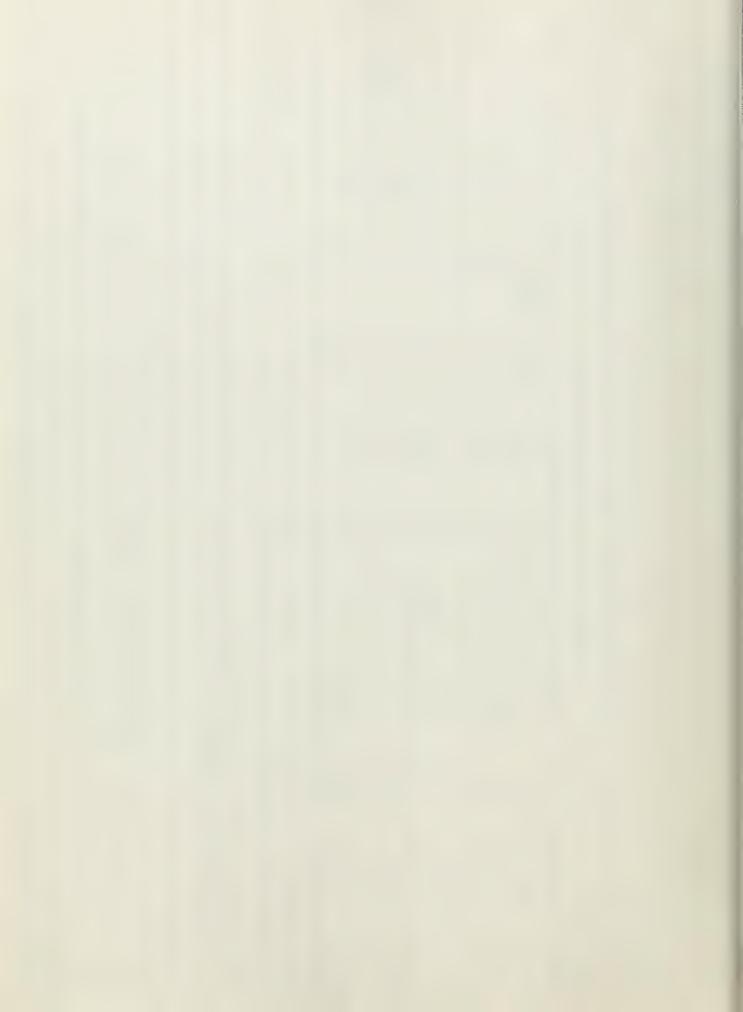
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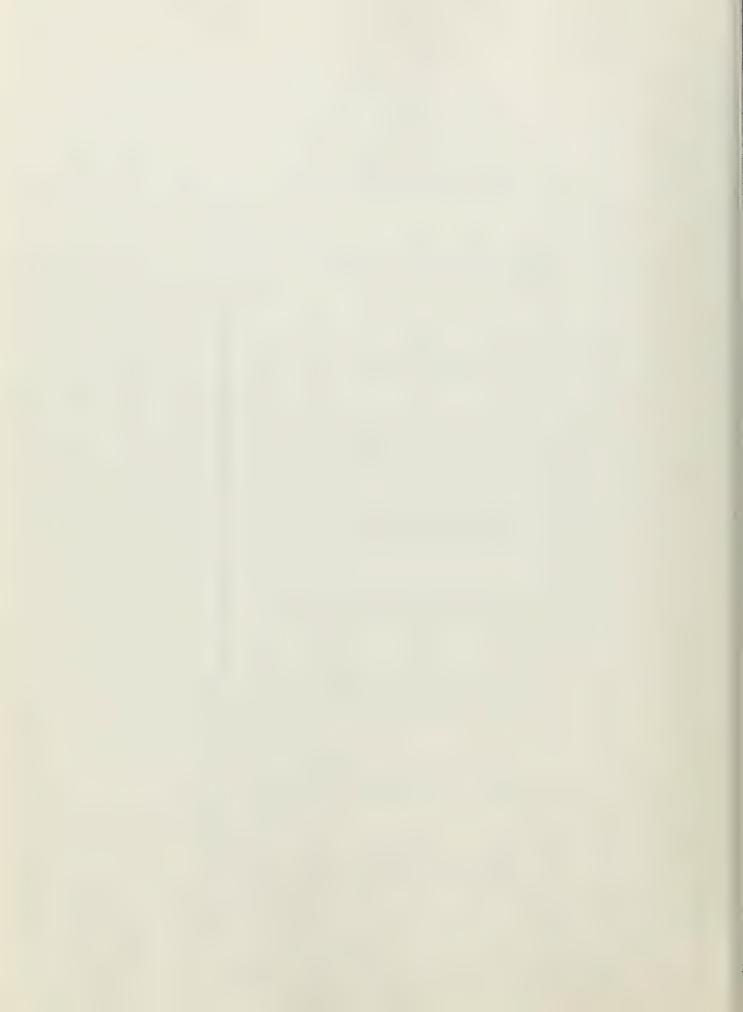
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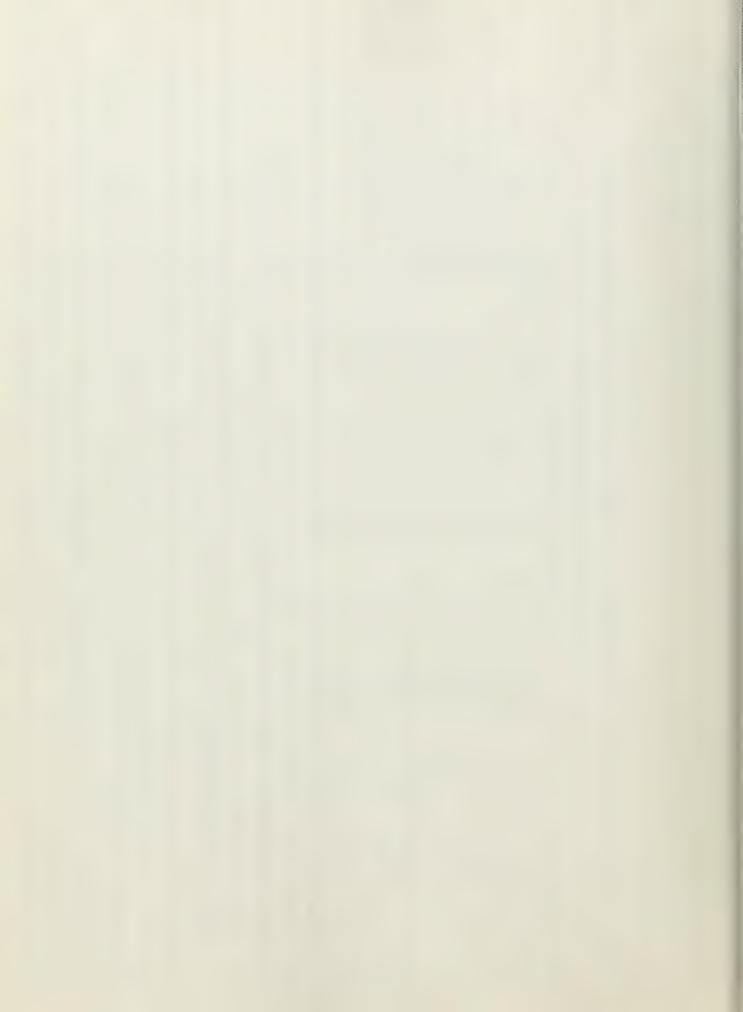
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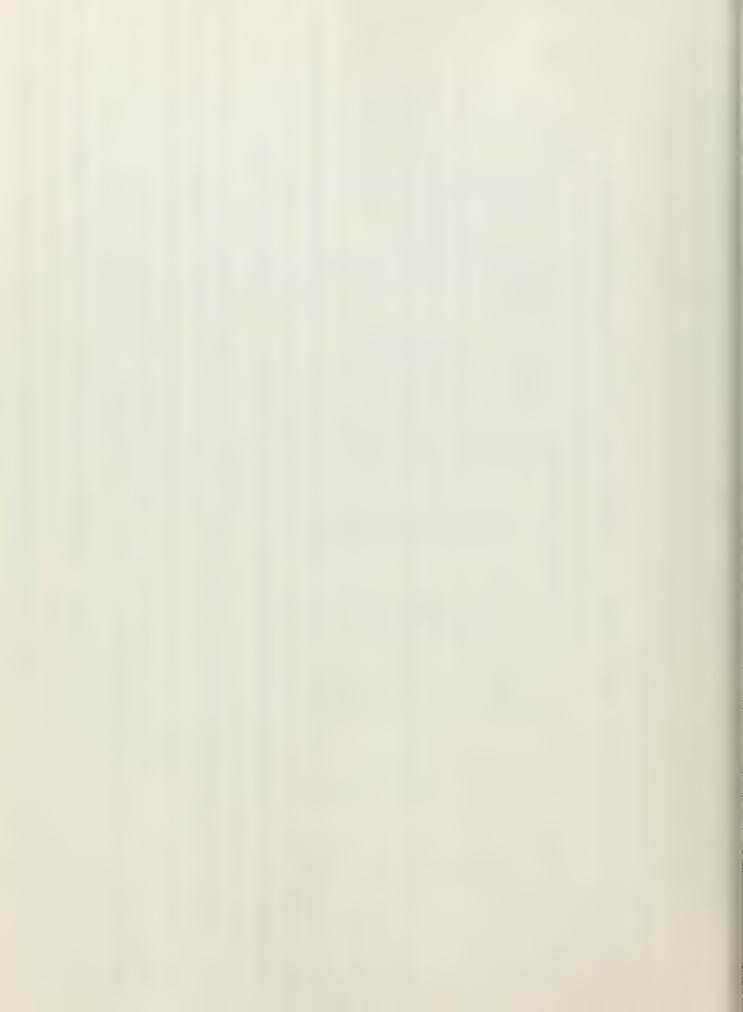
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